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Docket No.: 50099-180

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of	:	Customer Number: 20277
Shigenobu MAEDA, et al.	:	Confirmation Number: 8927
Application No.: 09/988,593	:	Group Art Unit: 2823
Filed: November 20, 2001	:	Examiner: T. Pham

For: SEMICONDUCTOR DEVICE HAVING IMPURITY REGION UNDER ISOLATION REGION (As Amended)

REPLY BRIEF

Mail Stop Appeal Brief – Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22202

Sir:

This Reply Brief is submitted in response to the EXAMINER'S ANSWER dated December 23, 2003.

REMARKS

The Examiner's response to Appellants' arguments submitted in the Appeal Brief of November 4, 2003, raises additional issues and underscores the factual and legal shortcomings in the Examiner's rejections. In response, Appellants rely upon the arguments presented in the Appeal Brief of November 4, 2003, and the arguments set forth below.

Appellants have argued that Flaker fails to identically disclose the following limitation found in independent claim 1:

said semiconductor region at least partially has a first conductivity type impurity region not mixed with an impurity of a second conductivity type different from said first conductivity type but doped by only an impurity of said first conductivity type.

For a particular feature to be identically disclosed within the meaning of 35 U.S.C. § 102, this feature must be either be explicitly or inherently disclosed by the applied reference. The Examiner has continued to assert that the claimed semiconductor region having the limitations reproduced above is disclosed in Flaker by the "BODY LINK" illustrated in Fig. 10B. This feature is also labeled with reference numeral 32.

Notwithstanding the Examiner's assertion that the body link 32 of Flaker identically discloses the claimed semiconductor region, the Examiner continuously fails to identify specifically where Flaker explicitly teaches that the body link has a first conductivity type impurity region not mixed with an impurity of a second conductivity type different from the first conductivity type. Furthermore, a review of Flaker also does not yield such a teaching. Therefore, Flaker does not explicitly disclose this claimed limitation.

Since Flaker does not explicitly disclose the claimed limitation at issue, the Examiner must be asserting that Flaker inherently discloses this limitation. Such an assertion was implied in the twelfth enumerated paragraph of the Final Office Action, which is reproduced, in part, below:

> applicants are directed to col. 6, lines 7-23 wherein the reference assures a precise control of the forming of element 62, therefore, no mixed impurities would exist in the body link 32. (emphasis added)

Although not specifically invoking the doctrine of inherency, the Examiner is arguing that since Flaker assures precise control of forming element 62, no mixed impurities would inherently exist in the body link 32. The Examiner, however, has failed to establish a necessary link between precise control of oxidation depth, as taught by Flaker, and the claimed limitation of a region "doped by only an impurity of said first conductivity type." Any asserted link between the Flaker's disclosed "precise control" of forming element 62 (see Fig. 14) and the types of impurities within the body link 32 (see Fig. 16) is misplaced at best.

The "precise control" that occurs during the formation of element 62 is illustrated in Fig. 14. It is interesting to note that in Fig. 14, the region of interest (i.e., body link 32) will eventually be formed from the material directly below feature 56, and feature 56 is positioned in a completely different location than element 62. Although there is a link between body link 32 and element 62 (see Figs. 15 and 16), this link is not relevant to the issue of whether or not the body link 32 includes a region doped by only an impurity of a first conductivity type. As illustrated in Flaker, the thickness T_3 of body link 32 after etching is equal to the total height T_1 of the layer minus the depth T_2 of the material that remains after element 62 is removed (i.e., $T_3 = T_1 - T_2$). Although a link exists between the "precise control" of forming element 62 (since this determines T_2) and the thickness T_3 of body link 32, the Examiner has failed to explain how controlling the thickness T_3 of body link 32 leads to a particular type and mix of impurities within the body link 32.

The Examiner, therefore, has failed to establish that precise control of oxidation depth would necessary result in the claimed limitation; and therefore, the Examiner has failed to

establish that Flaker inherently discloses the claimed limitation. Since Flaker neither explicitly nor inherently discloses the claimed limitation of a first conductivity type impurity region not mixed with an impurity of a second conductivity type different from the first conductivity type, Flaker fails to identically describe the claimed invention within the meaning of 35 U.S.C. § 102.

The Examiner's misunderstanding regarding doping and implanted regions is exemplified by the Examiner's comments in first full paragraph on page 4 of the Examiner's Answer, in which the Examiner stated:

> Then the oxide region 60 of fig. 13 is etched selectively to the p-type silicon (col. 6 lines 29-34) to leave the p-body and the body link without second conductivity type as shown in fig. 10B and figs. 14-20). Further, as shown in fig. 13, the sections of layer 46 underneath of the implanted regions are converted into oxide regions 62 and the references discloses implanting in areas not protected by layers 54 and 56. No implanted regions under 54 and 56 are depicted.

The Examiner makes several false assumptions that are not supported by Flaker and would also be readily recognized as false by one having ordinary skill in the art. Notwithstanding Fig. 13 illustrating, by line, a presumably perfect interface that separates N+ region 60 from P substrate 46, such a perfect interface would not exist in reality.

Upon doping with As, the P substrate 46, from top to bottom, will contain varying densities of N-type As dopants depending upon implant energies and dopant density during implantation. At a certain depth from the surface, the density of the As dopants in the substrate 46 will decrease to a certain predetermined level, and it is at this depth where an interface or boundary between the N+ region 60 and the P substrate 46 is generally defined. Notwithstanding this defined location of the interface, N-type As dopants are still present within the P substrate below this interface, but to a lesser degree than in the N+ region. As a result, when the N+ region 60 is converted into oxide region 62 (Fig. 14), not all of the N-type As dopants are

consumed, since N-type As dopants still reside within the P substrate 46. Therefore, the Examiner is not correct in asserting that "the oxide region 60 of fig. 13 is etched selectively to the p-type silicon (col. 6 lines 29-34) to leave the p-body and the body link without second conductivity type."

The Examiner also incorrectly assumes that layers 54 and 56 perfectly prevent any doping from occurring in the regions below layers 54 and 56. Notwithstanding the Examiner's statement that "[n]o implanted regions under 54 and 56 are depicted," Flaker's failure to depict implanted regions is based on expediency during drafting of the patent and not on reality. Drawings in a patent are only intended to enable the claimed invention, and therefore, do not need to disclose every feature. For this reason, the absence of a feature in a patent drawing cannot be considered a disclosure that a feature does not exist unless the absence of such a feature is explicitly or inherently disclosed within the specification.

Although features 54 and 56 both impede diffusion of the As dopants, features 54 and 56 do not completely prevent the As dopants from penetrating into the P substrate. Feature 56 is disclosed as being formed from a CVD oxide (i.e., silicon oxide, see column 6, lines 5-6), and there are literally thousands if not tens of thousands of U.S. patents in the semiconductor art that describe doping a substrate through a silicon oxide layer over the substrate. Therefore, one having ordinary skill in the art would readily recognize that the region below feature 56 (i.e., the region that includes body link 32) would include both P-type and N-type dopants.

Not only has the Examiner misunderstood the teachings of Flaker, the Examiner's "Response to Argument" underscores the Examiner's misunderstanding of the arguments presented by Appellants. In the first clause of the first sentence of the Examiner's Response to Argument, the Examiner misrepresents Appellants' arguments, and in the second clause of the first sentence, the Examiner misrepresents the teachings of Flaker. In the first clause, the Examiner characterized Appellants' arguments by stating "[i]n response to appellants' argument regarding the link between the precise control of the oxidation depth and the lack of doping of the region under element 62" (emphasis added). This characterization, however, is not accurate since Appellants stated the following:

> the Examiner has not provided any necessary link between precise control of oxidation depth, as indicated by Flaker, and the claimed limitation of a region "doped by only an impurity of said first conductivity type." (emphasis in original)

Appellants did not refer to the region under element 62 in Fig. 14. Instead, Appellants referred to the region "doped by only an impurity of said first conductivity type," which is what the Examiner asserts to be the body link (i.e., feature 32 in Fig. 10B). As shown in Figs. 14 and 17, the region directly below element 62 and feature 32 are found in completely different locations. With regard to the Examiner's assertion that "the regions under oxide 62 are not doped," as previous discussed herein, this assertion is false since N-type dopants exist throughout the P substrate 46. Although the Examiner asserted that this teaching is found in column 6, lines 11-23, a careful review of this citation fails to yield a statement from Flaker that "the regions under oxide 62 are not doped." Furthermore, when Flaker states that "the shallow N+ region is consumed" (emphasis added) in column 6, line 20, this statement should not be considered equivalent to a statement that all of the N+ dopants are consumed since N+ dopants still exist outside the N+ region.

Also, in the second and third sentence of the Response to Argument, the Examiner stated the following:

> Appellant [sic] alleges inherency of the regions under element 60 being doped but provides no reason to believe that doping as argued in inherent. Because this statement is conclusory, and not sufficiently probative of the relevant issues, it does not create a material issue of fact on which a reasonable trier of fact could find that the statement is true.

The Examiner has against misconstrued Appellants' argument. With the exception of this Reply Brief, Appellants' have not argued the inherency of the regions under element 60 being doped. Instead, Appellants have argued that the regions (i.e., body link 32) under oxide film 56 would inevitably be doped.

Furthermore, as argued in the first full paragraph on page 8 of the Appeal Brief, even *assuming arguendo* that no weight is given to Appellants' arguments that the body link 32 of Flaker would inevitably be doped with As dopants, the burden of establishing that Flaker identically discloses each limitation of the claimed invention still rests with the Examiner. The Examinee, however, has still failed to establish that the claimed feature of "doped by only an impurity of said first conductivity type" is either explicitly or inherently disclosed by Flaker.

For the reasons set forth in the Appeal Brief of November 4, 2003, and for those set forth herein, Appellants respectfully solicit the Honorable Board to reverse the Examiner's rejection under 35 U.S.C. § 102.

To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper,

including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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